

REVITALIZING OUR  
**RAVINES**

Ravine Overlay  
Unique Landscapes Have Unique Needs

A project by the Alliance for the Great Lakes, Chicago Botanic Garden, The Field Museum, and Openlands.

**Historical Context**

Ravines are important landscapes in coastal Illinois and Wisconsin communities. In some ravine communities, ravines have been set aside in parks. In other places, residents have built their homes close to ravines and developed their cities around ravine geography, incorporating city infrastructure like stormwater drains into ravine ecology. Regardless of how ravine communities have developed, residents value the ravines as beautiful, dynamic landscapes that support unique native plants and wildlife and connect to Lake Michigan. Protecting ravines so communities can continue to enjoy their benefits is critical.

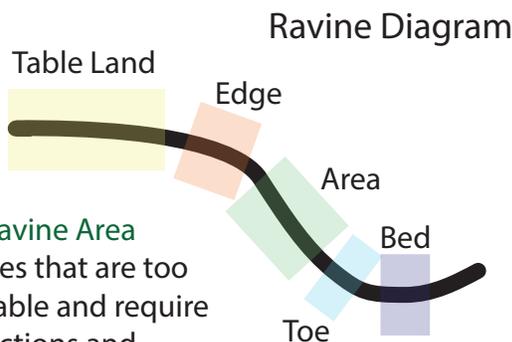
**Define Affected Geography**

When does a slope become a “steep slope?” Not all ravine communities agree, nor do they all have clear delineations that distinguish between the ravine bed, toe, area, and edge. Highland Park and Lake Bluff both define ravines or Ravine Areas as slopes greater than 10 degrees, while Lake Forest defines Ravine Area at 22 degrees or greater.

**Recommendations**

1) Ravine Overlays should define the following landscape features:

- Ravine Edge
- Ravine Area
- Ravine Toe
- Ravine Bed



2) Create High and Low Ravine Area designations. Ravine slopes that are too steep are inherently unstable and require greater protection from actions and development on the tableland.

**Goal: Guiding Development & Ravine Health**

- 1) Protect steep slopes from erosion and instability
- 2) Facilitate (re)development
- 3) Guide land uses

**Overview**

The Ravine Overlay guides development, land uses, rainwater management, and vegetation to ensure ravine stability and health.

**Affects Parcels containing:**

- Ravine Area
- Ravine Edge
- Ravine Toe
- Ravine Bed

**Policy Key Features**

- Buffers and setbacks
- Impervious surface limits
- Dangerous and hazardous land uses

**Soils Matter**

Define your steep slope stability threshold based on the common soil type of your community. The Bureau of Land Management identifies 1:2 (rise/run) or 26.6° as the threshold between a stable and unstable slope for “heavy clay” or “soft clay rich zones or wet seepage areas.”

(tinyurl.com/slopestability)

**Implementation Concerns**

Lake Michigan ravine communities (especially within the Lake Michigan watershed) are already developed. Current ravine property owners must be given various “grandfathered” accommodations. Consider incentive programs (cost-sharing, technical assistance, etc.) to encourage current homeowners to adopt new standards.

**Key Policy Themes**

buffers, setbacks, land uses, impervious surfaces



### Establish the First Line of Protection: Buffers and Setbacks

A riparian buffer is a vegetated strip near a stream where development is restricted to partially protect a stream from the impact of adjacent land uses. A riparian setback extends further beyond the buffer and guides land uses and development to minimally impact the stream and natural area. For ravines, buffers help stabilize the Ravine Edge through the deep roots of native plants and by slowing down water draining from the tableland to reduce slope erosion and gulley formation.

#### Good Buffer Requirements

- Require native plants
- Remove invasive plants
- Restrict turf grass
- Restrict structures
- Restrict impervious surfaces

#### Good Setback Requirements

- Require native plants
- Remove invasive plants
- Restrict pools and large structures
- Allow turf grass
- Allow small non-permanent structures (tool shed)

### Fit Buffers & Setbacks to Slope Steepness

High Ravine Area slopes require a longer buffer than Low Ravine Area slopes because these slopes are inherently more unstable.

State of Michigan recommends a minimum 50ft buffer from stream edge, but extends the buffer in 5ft increments as slopes increase from

- to 15 degrees = add 10 ft (60 ft total)
  - 25 degrees and above = add 70 ft (120 ft total)
- ([tinyurl.com/michiganbuffer](http://tinyurl.com/michiganbuffer))

### Current Ravine Buffers & Setbacks

#### Ravine Buffers

Most Lake Michigan ravine communities do not have ravine buffers.

#### Ravine Setbacks

- Lake Forest restricts within 20ft of ravine
- Highland Park restricts within 10ft of ravine
- Lake Bluff restricts within 10ft of ravine

### Ravine Buffer and Setback Recommendations

Another important landscape feature in ravine communities are the steep sloped bluffs leading into Lake Michigan. Bluffs and ravines are almost always defined using the same slope angle (i.e.: 22 degrees for Lake Forest), but often treated differently. Factors in slope stability such as soil composition, vegetative cover, depth of root systems, and tableland land uses interact similarly on both ravine and bluff slopes. However, bluff setbacks are usually significantly longer than ravine setbacks at 40 to 50 feet from the slope edge. A Ravine Overlay is an opportunity for municipalities to protect ravine slopes to much the same degree they already do for their bluffs.

Buffers and setbacks are critical for sensitive landscapes and riparian areas. They stabilize slopes - reducing the risk of slope collapse, which destroys private property value, fosters further erosion, and pollutes ravine streams and Lake Michigan with sediment.

#### Recommendations

##### Low Ravine Area

- Buffer = 20 ft
- Setback = 20 ft

##### High Ravine Area

- Buffer = 25 ft
- Setback = 25 ft

Many thanks to Angela Larsen and Margaret Catania of Alliance for the Great Lakes, and the Ravine Practitioners Network. For more information:  
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## Establish Impervious Surface Goals

The greatest threat to our ravines is stormwater. During extreme storm events, rainwater falling within the Lake Michigan watershed aggregates via municipal stormwater pipes pointed into the ravines to carve out ravine beds and toes, destabilizing slopes and threatening tableland property. Reducing impervious surfaces of properties both within the Ravine Overlay and which drain into ravines (within Lake Michigan Watershed) is a key solution to the longterm protection of our ravines.

Impervious surface rates of 10% or higher begin to negatively impact water quality, and at 25% or higher there is severe degradation of receiving streams. **To protect the water quality of our ravine streams and Lake Michigan, we recommend establishing an effective impervious surface rate of 25% or less as a goal.** Actions to reach an effective impervious surface rate of 25% or less must accommodate current property owners and be politically realistic. It can take a lot of steps and take a lot of different forms.

### Current Impervious Surface Limits

#### Highland Park

50% Limit

#### Lake Forest

50% Limit

#### Lake Bluff

50% - 60% Limit

Portland Oregon's Downspout Disconnection Program was a successful public outreach campaign that disconnected over 56,000 downspouts over the course of 18 years to remove 1.8 billion gallons of stormwater from the sewer system annually. ([tinyurl.com/disconnectdownspouts](http://tinyurl.com/disconnectdownspouts))

Duluth Township, Minnesota passed a Sensitive Areas Overlay to protect Lake Superior by reducing impervious surface limit from 25% to 5% for lake adjacent land. ([tinyurl.com/sensitiveareaoverlay](http://tinyurl.com/sensitiveareaoverlay))

## Recommended Steps to Reach 25% Impervious Surface Rate Goal

- 1 Form a working group to establish goals.
- 2 Calculate actual impervious surface rate for entire community, area within Lake Michigan watershed, and area within Ravine Overlay.
- 3 Perform cost-benefit analysis of integrating pervious surfaces and onsite rainwater management into capital improvement projects.
- 4 Identify a mix of actions (ordinances, capital improvement coordination, residential programs, incentives, etc.) that would reach an impervious surface rate of 25% or less.
- 5 Work with partners to implement actions to achieve an effective impervious surface rate limit of 25% or less for land within Ravine Overlay.

## Guide Dangerous and Hazardous Land Uses Away from Ravines

Rainwater on ravine landowner property generally drains into the ravines, which in turn drains into Lake Michigan, the source of our drinking water. There is ample precedent across the country for restricting hazardous land uses and activities near riparian corridors and sources of drinking water.

**Dangerous Land Uses** like septic tanks, drainfields, trash containers, salty snow pack storage, and dumpsters can leach pollutants and hazardous chemicals into ravine soil, which can then seep via ravine slopes down into the stream during heavy precipitation events.

County of York, VA prohibits dangerous landuses within 500ft of the riparian buffer.

([tinyurl.com/yorkwatershed](http://tinyurl.com/yorkwatershed))

Michigan recommends locating such land uses 150-300ft away from stream corridors.

([tinyurl.com/michiganriparian](http://tinyurl.com/michiganriparian))

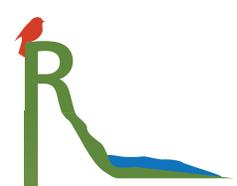
**Spill Control Plans** protect ravine and Lake Michigan water quality from hazardous chemicals. Ravine communities should ensure ravines are not flushed with harmful chemicals.

Environmental Protection Agency (EPA) recommends businesses (i.e. mechanic shops) operating within a riparian buffer to submit spill control plans to their municipalities.

([tinyurl.com/epa-model](http://tinyurl.com/epa-model))

Draining chlorinated swimming pools and hot tubs into ravines harms aquatic plants and wildlife.

Connecticut requires public and private swimming pool owners/operators to submit a Discharge Permit. ([tinyurl.com/CTpooldischarge](http://tinyurl.com/CTpooldischarge))



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## Ravine Property Landscaping Plants and Water are the Keys to Ravine Health

### Setting Up Ravines to Thrive as Living Landscapes

The health of ravines (edge, area, toe, and bed) is primarily defined by the plants that are the foundation of the ecosystem and erosion control, and the water that runs off and flows down and into the ravine. This landscaping ordinance case study addresses how municipalities can guide ravine homeowners to manage the plants and water of their ravine properties.

### Goal: Facilitate Good Ravine Landscaping

- 1) Increase stability and health of ravine system
  - a) Increase sunlight on ravine slopes
  - b) Remove invasive species and plant native species
  - c) Increase biodiversity of ravine habitat
  - d) Reduce or slow down stormwater into ravine
- 2) Increase ease of property owner compliance/implementation

### Require Native Plants

Ravines are globally rare ecosystems and home to unique native plants. Ravine communities should ensure ordinances for steep slopes or riparian areas require native species to be planted. Since plant communities nearby affect ravine ecosystems, landscaping guidelines should extend beyond the slopes.

- Require native species in ravines
- Require native species within ravine buffers
- Restrict invasives within the Ravine Overlay

### Pair Plants with their Preferred Conditions

Ravine slope microclimates can impact viability of plantings - pair landscaping ordinances with lists of native plants with preferred conditions.

Highland Park prepared such a ravine plant resource. ([tinyurl.com/ravinenativespecies](http://tinyurl.com/ravinenativespecies))

City of Asheville, NC's landscaping ordinance differentiated plant guidelines based on slope exposure. ([tinyurl.com/slopeplantsashville](http://tinyurl.com/slopeplantsashville))

### Overview

This case study works in tandem with the Ravine Overlay case study. They are resources for municipal land managers as they plan for improved health and stability of the ravine systems along Lake Michigan coast.

### Policy Key Features

- Require native plants
- Onsite rainwater management
- Clear ordinance language
- Balance permitting requirements

### Slow Down and Detain Rainwater

Landscaping ordinances should promote or at least easily allow property owners to manage rainwater onsite to through nature-based solutions like rain gardens and bioswales. Property owners within the Ravine Overlay should be guided to manage rainwater onsite:

- Disconnect downspouts connected to residential "elephant hoses" draining into the ravine
- Direct runoff from impervious surfaces into nature-based solutions
  - Detain rainwater during storm events
  - Slow down rainwater entering the ravines during high precipitation storm events

### One Home for Nature-Based Solutions

Most current city codes have regulations overseeing nature-based solutions like rain gardens in multiple locations, making it a challenge for homeowners to implement.

Municipalities should consolidate ordinances on nature-based solutions in one place and create a sub-set of guidelines for properties which fall within the Ravine Overlay.



## Maintaining a Dynamic Ravine Landscape

Ravines are dynamic, highly erosive landscapes. Furthermore, since our ravines are owned by thousands of homeowners and land managers and often have municipal outfalls opening out to the ravine bed, merely helping homeowners set up their ravine areas to thrive is not enough - we must help them maintain their ravines as dynamic landscapes.

### Maintaining a Vibrant Plant Ecology

#### Facilitate Removal of Invasive Trees

Trees are important to ravine stability and ecosystems, but they can also create a crowded canopy that blocks out sunlight to the ground below. Too much shade on ravine slopes prevents the growth of vital understory plants, resulting in decreased biodiversity and patches of exposed soil which can destabilize the slope during rainstorms.

Facilitate the removal of invasive shady trees like the Norway Maple. For Low Ravine Areas (slopes below a degree threshold where they are inherently unstable), municipalities should consider allowing the removal of Norway Maples without requiring a landscape plan, or even certain permits.

#### Coordinate Prescribed Burns

Fire has an important role in ravine ecologies and slope stability. Most ordinances that address prescribed burns in steep slope areas note that deep rooted plant communities that stabilize slopes often benefit from periodic burning.

In Southern California, the Rocky Mountain region, and elsewhere, communities often mandate prescribed burns in urbanized areas where wildfires threaten human settlement.

For ravine communities where wildfires do not pose as severe a threat and requiring mandated prescribed burns is less feasible, ordinances should incentivize coordinated prescribed burns (multiple ravine property owners adjacent to each other) where costs are shared by ravine homeowners. Local Parks or Urban Forestry department could regularly reach out to adjacent ravine property owners to encourage coordinated burns.

### Reducing Rainwater's Erosive Impacts

#### Maintain Nature-Based Rainwater Solutions

Ordinances that allow or encourage property owners to manage rainwater onsite through nature-based solutions tend to specify roles for both the municipality and the property owner in maintaining these systems.

Property owners are responsible for installation and ongoing upkeep of these systems. Municipalities are responsible for reviewing plans, issuing permits, inspecting installed systems and then conducting periodic inspections to ensure ongoing functionality.

Some ordinances differentiate between large and small scale projects and describe a substantially reduced municipal role for smaller projects (See page 3). This may make sense for municipalities that do not have the capacity to oversee all residential rainwater capture and management.

#### Limit Irrigation

Older ordinances do not necessarily address irrigation, but more recent ordinances for steep slopes and riparian areas tend to limit irrigation. Some ordinances prohibit the use of automatic sprinklers in buffer areas. Ordinances often promote onsite stormwater capture and management systems as practices that can reduce or even replace the use of sprinklers or manual watering.

#### Limit Exposed Soil

Exposed ravine soil is one rain storm away from potential destabilization. Many ordinance will not allow soil be left without vegetation for more than 24 hours. For areas greater than a certain square footage (generally about 250 square feet) some ordinances require the installation of erosion control mats with native species.



## Municipal Role in Implementation

The best riparian and steep slope ordinances are detailed while still having a clear and relatively easy path for property owners to protect special natural areas. Often this is achieved through differentiating projects and requiring professional plans and permits for large projects while requiring little or no approval for small projects.

### Landscaping projects that might require professional landscaping plans and permits

- Grading and excavation
- Tree removal within High Ravine Areas (See Ravine Overlay)
- Installing irrigation systems that require excavation, including rain gardens/bioswales that are more than a specific depth and size

### Landscaping projects that might NOT require professional landscaping plans and permits

- Planting native shrubs and grasses by hand
- Removal of non-native trees within Low Ravine Areas (See Ravine Overlay) or buffers
- Removal of non-native plants
- Disconnecting downspouts to install rain barrels/cisterns
- Installing rain gardens/bioswales less than a specific depth and size

### Non-Permitted Tree Removal

Of Lake Michigan ravine communities, Lake Forest has the clearest path for non-permitted tree removal. Permits must be acquired to remove trees from a bluff or ravine. However, a permit is not required to remove trees from most other areas on a ravine property. [tinyurl.com/LakeForestTree](http://tinyurl.com/LakeForestTree)

### Barriers to Implementation

Inconsistent/ incomplete definitions of ravine edges in current ordinances can be both confusing and insufficiently protective of the ravine system.

Current ordinances in some municipalities have excessive requirements that may thwart property owner efforts to make positive changes.

i.e. Requirements for 1 to 1 tree replacement and/or landscape architecture plan for any ravine area work

On many properties there are pre-existing structures and landscaping that would not be compliant with ideal ordinances.

### Implementation Recommendations

Adopt clear definitions of a ravine bed, toe, area, edge, and buffer. (See Ravine Overlay case study)

Clearly identify which projects do and do not need municipal oversight. For those that do, the process should be clear and information should be available online.

Provide clear guidelines for how to approach these non-compliant land uses and support property owners in making incremental improvements.

Many thanks to Margaret Catania (primary researcher and content provider) and Angela Larsen of Alliance for the Great Lakes, and the Ravine Practitioners Network. For more information: Ethan Brown, Resilience Coordinator at Alliance for the Great Lakes, [ebrown@greatlakes.org](mailto:ebrown@greatlakes.org)